

# PROJECT FACT SHEET

**CONTRACT TITLE:** Reservoir Characterization of Pennsylvanian Sandstone Reservoirs

**DATE REVIEWED:** 01/12/93

**DATE REVISED:** 12/04/92

**OBJECTIVE:** Utilizing Pennsylvanian Age sandstone reservoirs in the Mid-Continent regions, this project will investigate:  
 1) the application of fractals to reservoir characterization,  
 2) the use of outcrop studies in evaluating small scale heterogeneities, and  
 3) the application of geostatistical techniques in evaluating in-fill drilling prospects.

**ID NUMBER:** DE-AC22-90BC14651

**B & R CODE:** AC1510100

**CONTRACT PERFORMANCE PERIOD:**

08/09/90 to 08/08/93

**PROGRAM:** EOR

**RESEARCH AREA:** Geoscience

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## SCHEDULED MILESTONES:

Data collection on Bartlesville and Bluejacket sandstones.	01/91
Conduct porosity and permeability studies.	06/91
Complete statistical comparison of the reservoir heterogeneities.	08/92
Apply geostatistical methods to production data.	06/93
Final report.	10/93

FUNDING (1000'S)	DOE	OTHER	CONTRACTOR	TOTAL
PRIOR FISCAL YRS	271	0	296	567
FISCAL YR 1993	0	0	0	0
FUTURE FUNDS	0	0	0	0
TOTAL EST'D FUNDS	271	0	296	567

**PROJECT DESCRIPTION:** 1. Fractals application to reservoir description will be tested for Pennsylvanian sandstone reservoirs, specifically: (a) applicability of fractal dimension to define individual formations will be investigated, (b) use of various qualities and quantities of data in defining the reservoir characteristics will be evaluated, (c) suitability of three-dimensional simulations of waterflood reservoirs will be investigated, and (d) appropriate methods to estimate effective properties of a grid block will be evaluated.

2. The utility of outcrops in describing reservoir details will be investigated, specifically: (a) the contractor will quantitatively compare the reservoir wellbore data with the outcrop wellbore data, and (b) the contractor will quantitatively relate the vertical variability to horizontal variability of outcrop data.

3. The application of geostatistical techniques for predicting potential of infill drilling prospects will be studied, specifically, the utility of geostatistical techniques in using past production performance to predict future potentials of yet unexplored locations will be analyzed.

**PRESENT STATUS:** The project is progressing on schedule, except the outcrop studies.

**ACCOMPLISHMENTS:** 1. Data collection step is complete. Drilling of 12 wells on the outcrop, and collecting cores and logs has been completed. The cores have been plugged and permeability and porosity measurements on individual plugs have been completed. Geological description of the outcrop surface is complete.

2. A three dimensional simulator to generate reservoir properties distribution has been completed and has been extensively tested using field data. Three papers have been published related to this area.

3. Analytical method to estimate effective grid block permeability tensor in two dimensions has been completed. The method has been verified for cross bedding sandstone reservoirs. A computer program is written to estimate the effective properties using scale measurements. The method has been verified for simulation for waterflooding in the presence of heterogeneities.

4. Indicator and probability kriging techniques have been tested to examine their application for selecting in-fill locations. New method is being developed to incorporate data as a constraint in reservoir description process.

**BACKGROUND:** Research will concentrate on application of newly established reservoir characterization techniques to Pennsylvanian Age sandstone reservoirs in the Mid-continent region, emphasizing the hydrocarbon reservoirs located in Osage County, Oklahoma. Several reasons support this choice: 1) currently, 16,000 wells are operational in this county, and the log data on all these wells are available through the U.S. Department of Interior, Bureau of Indian Affairs, Osage Agency; 2) three to four thousand core and drill stem tests are also available through the Osage Agency; 3) the largest waterflooding project in Oklahoma, Burbank Field, is located in Osage County; and 4) Phillips Petroleum Company, the operator of Burbank Field, has agreed to supply the necessary information on this field.

The objectives are three fold: 1) to study the feasibility of applying fractal geometry techniques to characterize Pennsylvanian sandstone reservoirs; 2) to validate the utility of outcrop studies in describing the variability in properties on various scales in petroleum reservoirs; and 3) to use conventional and modern geostatistical techniques to analyze available production data to predict future prospects of infill drilling.